

# **Accelerator Production of High Specific Activity Therapeutic Radionuclides.**

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# **Biomedical Applications for an ISOL/ISAC Facility:**

- **Produce High Specific Activity  
Radiotoxic Nuclides**
- **Implantation of Radionuclides**

Many clinically relevant therapeutic nuclides can not be produced in high specific activity from reactors and the accelerators can not produce sufficient quantities for large scale usage.

# Candidate radionuclides for radioimmunotherapy:

$^{47}\text{Sc}$

$^{67}\text{Cu}$

$^{77}\text{As}$

$^{90}\text{Y}$

$^{105}\text{Rh}$

$^{109}\text{Pd}$

$^{111}\text{Ag}$

$^{131}\text{I}$

$^{142}\text{Pr}$

$^{149}\text{Pm}$

$^{153}\text{Sm}$

$^{159}\text{Gd}$

$^{166}\text{Ho}$

$^{177}\text{Lu}$

$^{186/188}\text{Re}$

$^{194}\text{Ir}$

$^{199}\text{Pt}$

$^{211}\text{At}$

# Problem

- Reactor production - Low Specific Activity.
- National Lab Accelerators - Capacity for large scale production insufficient.

Possible Solution:

Production in reactors or spallation  
sources with off-line isotope separation.

**Reactor produced radionuclides that  
potentially could be prepared via  
ISOL:**

**$^{105}\text{Rh}$**

**$^{109}\text{Pd}$**

**$^{111}\text{Ag}$**

**$^{142}\text{Pr}$**

**$^{149}\text{Pm}$**

**$^{153}\text{Sm}$**

**$^{159}\text{Gd}$**

**$^{166}\text{Ho}$**

**$^{177}\text{Lu}$**

**$^{186}\text{Re}$**

**$^{188}\text{Re}$**

**$^{194}\text{Ir}$**

# Implantation Research

- + ions implanted with 60 keV into different backings:
  - - Mylar foils
  - - filter paper
  - - polyethylene foil
  - - aluminum foil



# Production of Selected Isotope

Isotope	ISOLDE Yield (atoms/ $\mu$ A sec)	Projected ISAC Yield mCi/100 $\mu$ A day
$^{105}\text{Rh}$	$1.5 \times 10^8$	190
$^{109}\text{Pd}$	$2.4 \times 10^9$	790
$^{142}\text{Pr}$	$1 \times 10^7$	23
$^{149}\text{Pm}$	$4.3 \times 10^5$	0.4
$^{153}\text{Sm}$	$8.7 \times 10^7$	83



## 12kv 125Xe implanted

